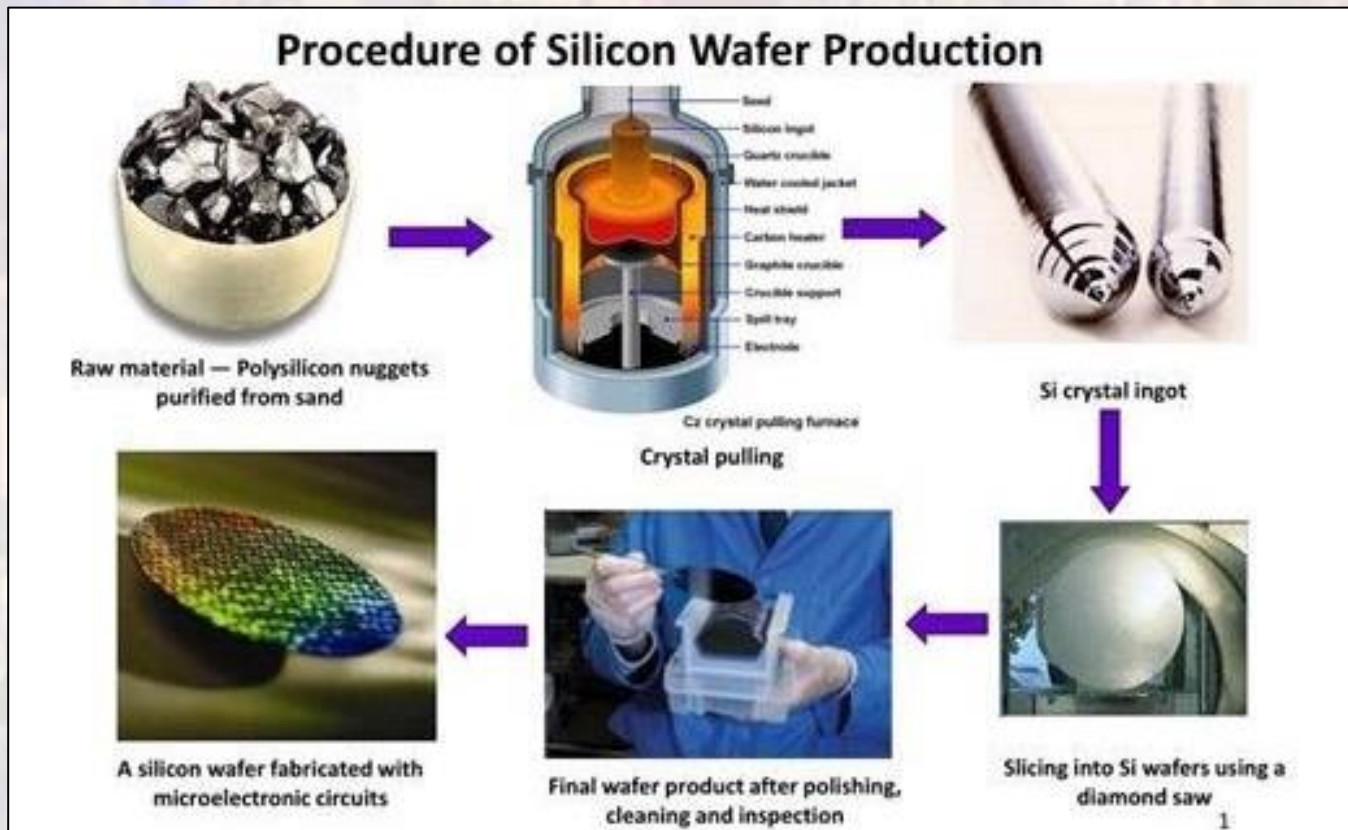


Integrated Circuit Processes

Last updated 1/18/24

IC Processes

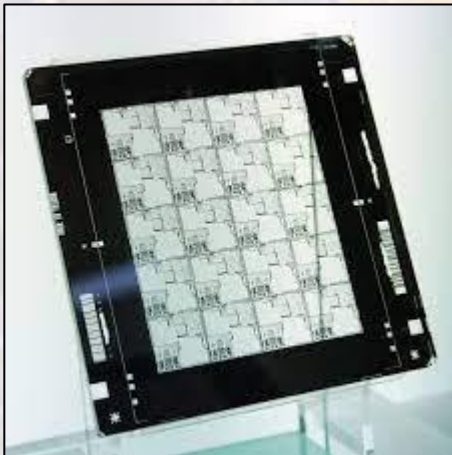
- Wafer Creation



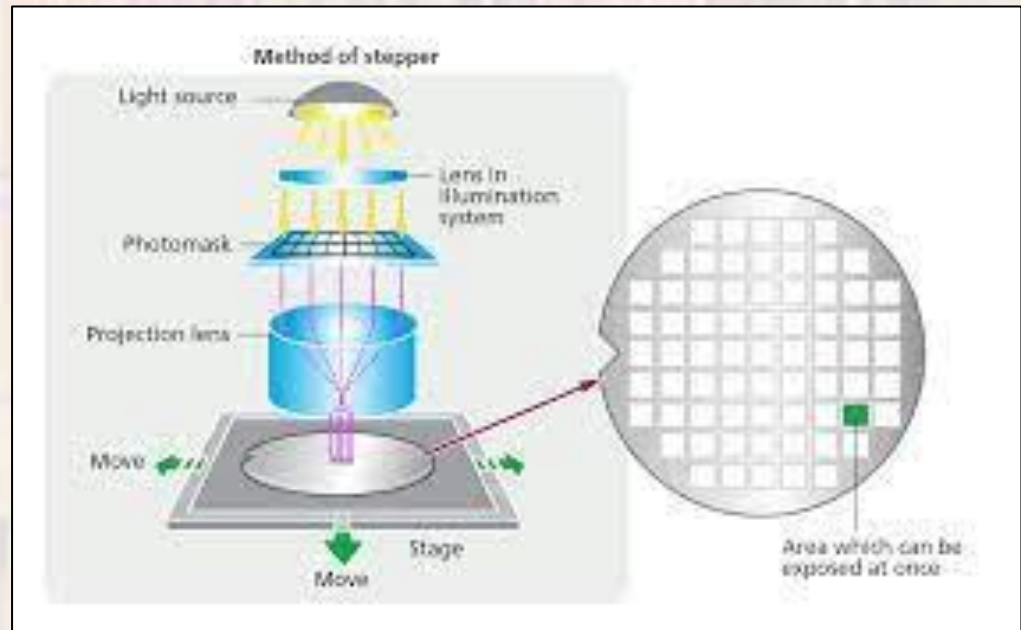
Src: AZoM

IC Processes

- Photomask
 - Glass (reticle) with a pattern formed on it with a light blocking material (chrome)
 - Stepped across a wafer to make multiple copies of the pattern
 - Used to block light from hitting the photoresist



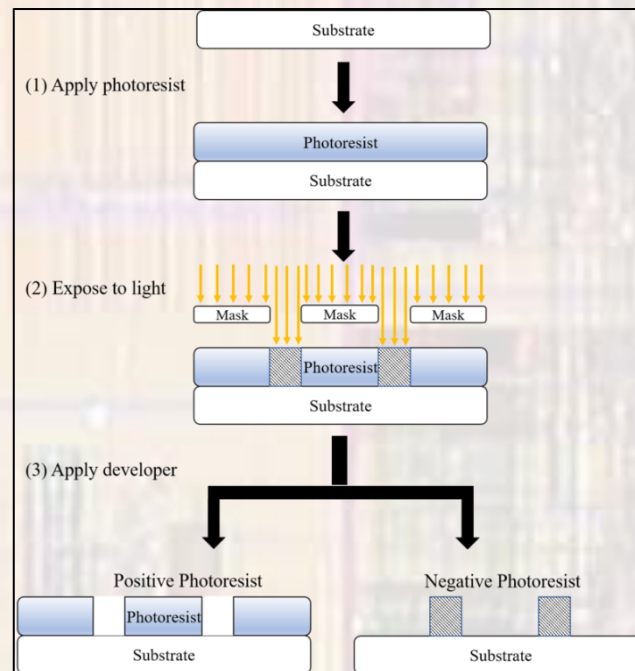
Src: wikipedia



Src: Nikon

IC Processes

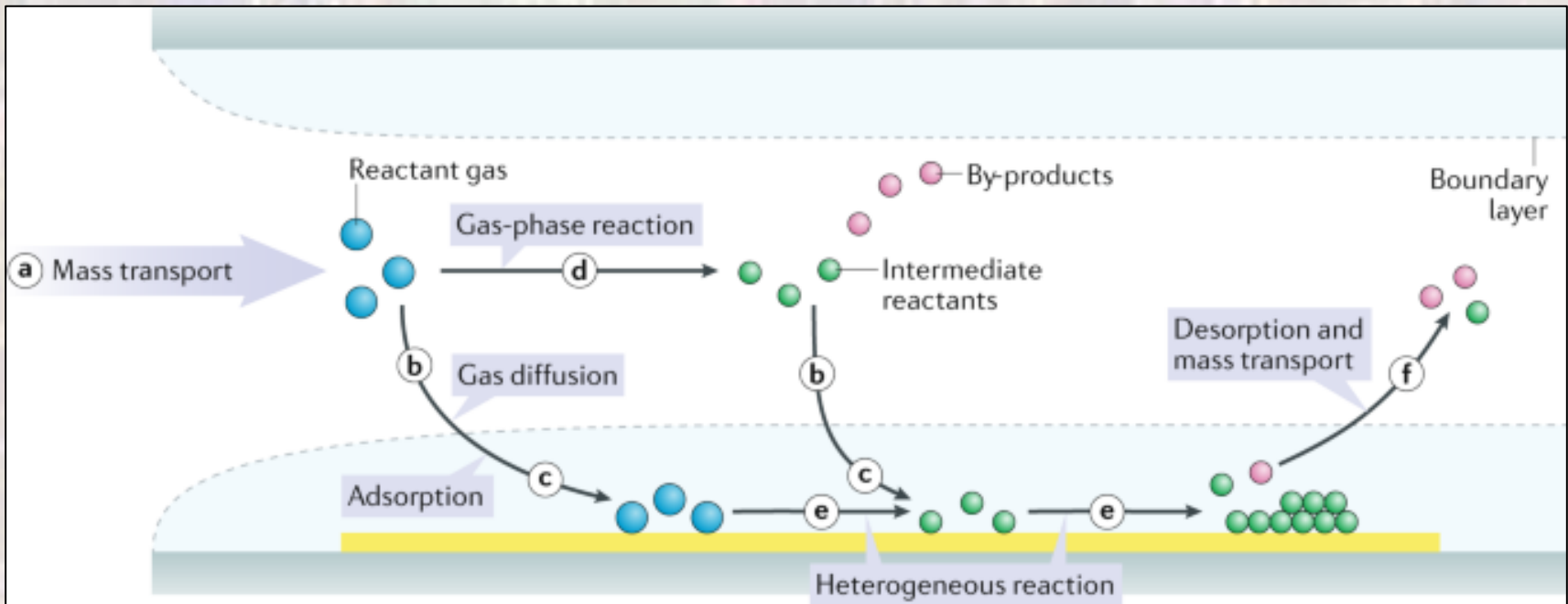
- Photoresist
 - Transparent coating that changes state when light is shined on it (UV)
 - Positive Resist – becomes soluble in developing agent (washes away)
 - Negative Resist – becomes in-soluble in developing agent (stays put)



Src: wikipedia

IC Processes

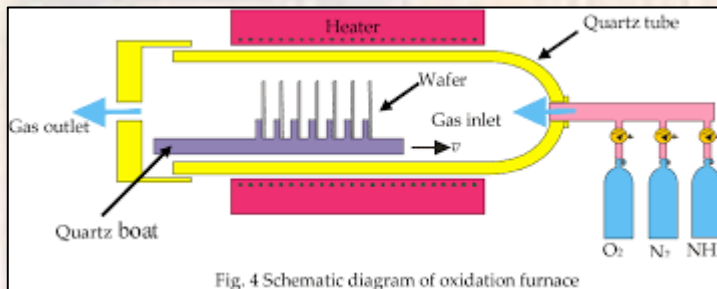
- Chemical Vapor Deposition (CVD)
 - Deposit layers of a molecule on a surface



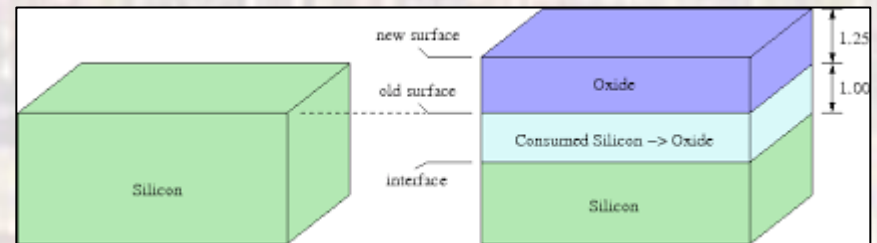
Src: Nature

IC Processes

- Oxidation
 - Grow SiO_2 from existing silicon and oxygen
 - Some of the original Si is consumed in the process



Src: Semantic Scholar



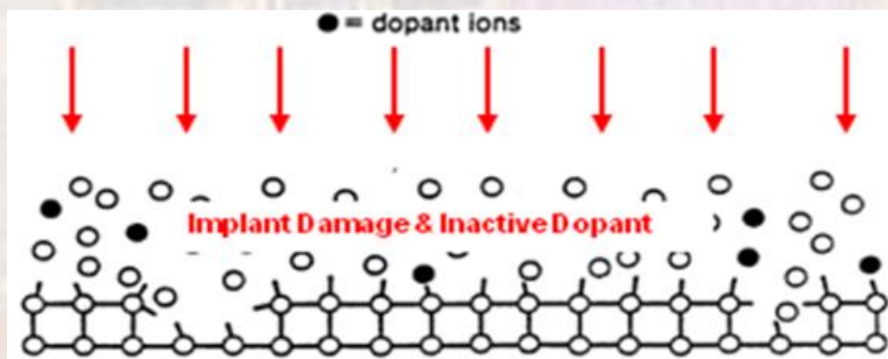
Src: iue.tuwien.ac.at

IC Processes

- Ion Implantation

- Molecules are “shot” at a target (surface) with high energy
 - Molecules become embedded in the target material
 - The target material is damaged in the process
- The target is heated to allow the target to anneal
 - Thermal energy allows the target molecules to re-align

Implantation



Anneal



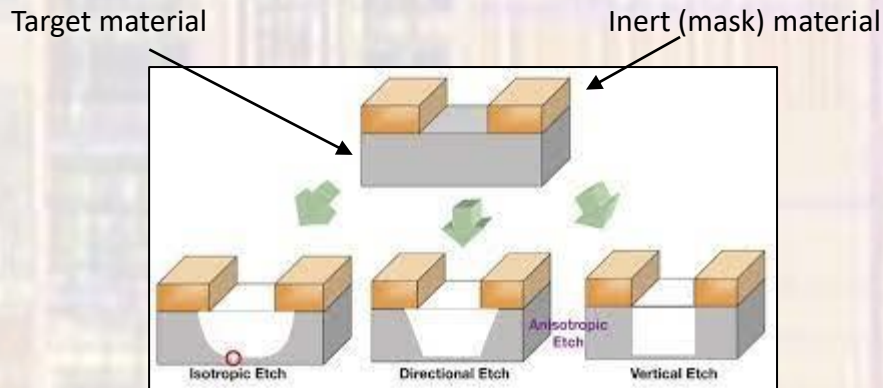
Src: IntechOpen

IC Processes

- Etching

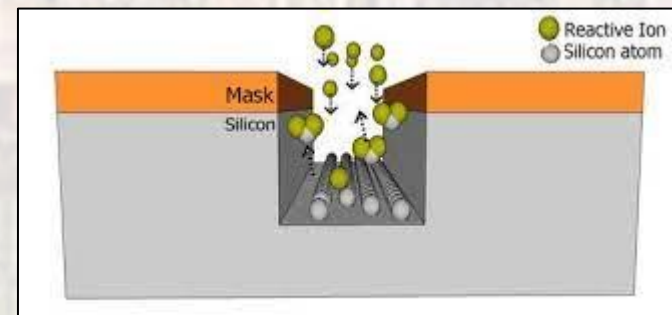
- Removal of a specific (target) molecule using
 - Wet (chemical) etching – chemical process to free up and wash away molecules
 - Dry (plasma) etching – ions are “shot” at the surface under a vacuum. Ions combine with the target material and are carried away

Wet etch



Src: MKS Instruments

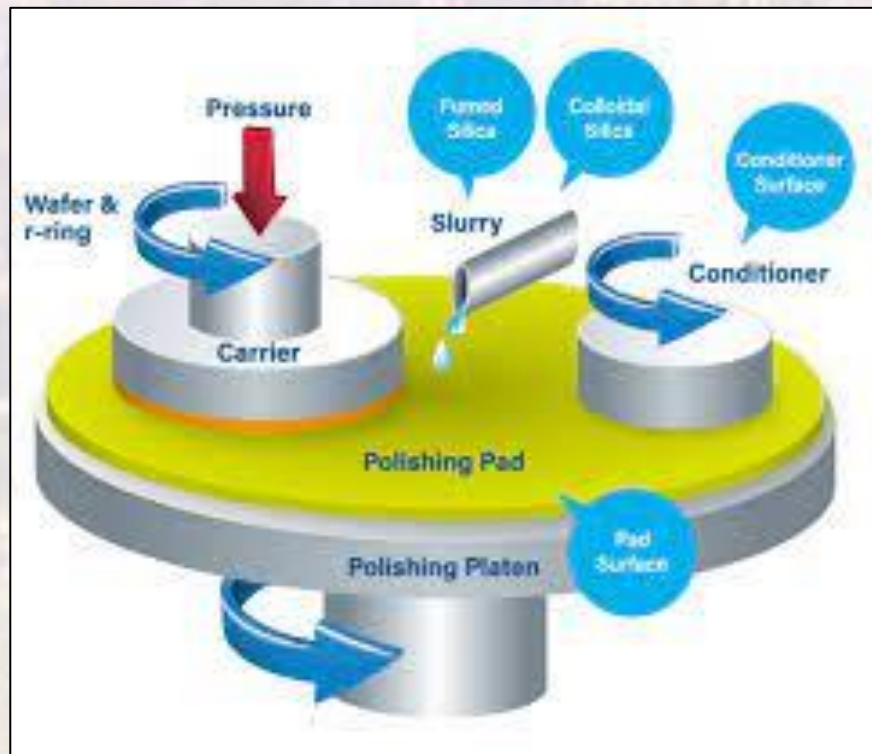
Dry Etch



Src: UC Davis

IC Processes

- Planarization
 - Flatten the surface of a wafer prior to further processing
 - Especially important prior to metallization
 - Can be used on the back side to thin the wafer



Src: HORIBA

IC Processes

- Clean Room
 - Room with highly cleaned surfaces and air to minimize particles that can settle onto a semiconductor wafer
 - Bunny suits required !
 - Wafers rarely (never) touched by humans – all robotics



Src: TurboFuture